

Newton Video #1

Answer the following questions on a separate sheet of paper and turn in by the end of the period.

1. If you flip a coin in an airplane going at constant speed, the coin will....
2. What does the coin do when the plane is landing (slowing down)?
3. What is the friction force acting on a wood block moving at constant speed when a 3N force is applied to it?
4. What is the air resistance acting on a plane moving at constant speed when 18tons of thrust is applied?
5. Acceleration is _____ proportional to net force.
6. What is the equation of explaining Newton's Second Law?
7. Acceleration is _____ proportional to mass.
8. _____ never pulled together the constant ratio between force and mass; Newton did.
9. Why does a heavy object fall with the same acceleration as a light object?
10. What is the force of air resistance acting on a leaf falling at constant speed?

Newton Video #2

Answer the following questions on a separate sheet of paper and turn in by the end of the period.

1. For every action there is an ...
2. Does a stick of dynamite contain force?
3. Two teams playing tug of war each pull on opposite sides of a rope with a force of 400N. What does the scale in the middle of the rope read?
4. We move by _____ forces.
5. How can a sink make you weigh more or less?
6. What can we say about the force acting on a bullet compared to the reaction force acting on the gun?
7. What makes a rocket move in the vacuum of space?
8. Why can't you hit a piece of paper with 50lbs of force?
9. What is the horse's argument for not pulling the cart to market?
10. Why is the horse's argument incorrect?

Project

- Observe a bowling ball being swept around with a broom.
- Be able to discuss and describe your observations to the class.
- Be able to explain what you observed in terms of velocity, acceleration, mass, inertia, and net force.

Lesson #27

Topic: Newton's Second Law

Objectives: (After this class I will be able to)

- Explain how an object's mass and the net force acting on it relates to its acceleration.

Warm Up: Is it harder to accelerate a bowling ball or a tennis ball? Why?

Assignment: Transparency 4-2 Due tomorrow!

Newton's Second Law

- A non-zero net force acting on an object will cause that object to accelerate.
- The direction of the acceleration will always be the same as the direction of the net force.
- The more net force applied to an object, the more it will want to accelerate.
- The more inertia (mass) an object has, the more it will resist accelerating.

Newton's Second Law

- ***The acceleration of an object is directly proportional to the net force acting on that object and inversely proportional to the mass of the object.***

- For example:

$$a = \frac{F_{net}}{m}$$

or

$$F_{net} = ma$$

- The stronger the net force applied, the **bigger** the acceleration.
- The more massive the object, the smaller the acceleration.
- This is why it requires less force to accelerate a tennis ball than a bowling ball.

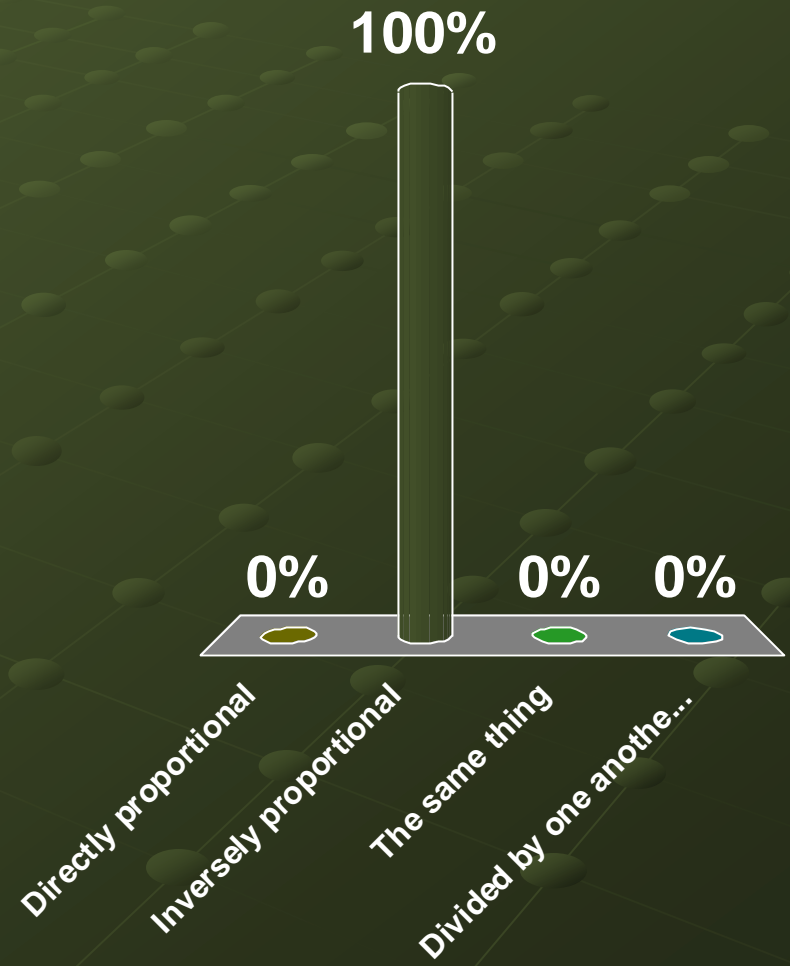
Newton's Second Law

- It is Newton's Second Law that gives us the equation for the force due to gravity, or weight.
- If a 2kg object is in free fall, the only force (and therefore the net force) acting on an object is the force due to gravity.
- Mass = Acceleration=
- Then we can calculate the net force acting on it using Newton's Second Law.

$$F_w = mg$$

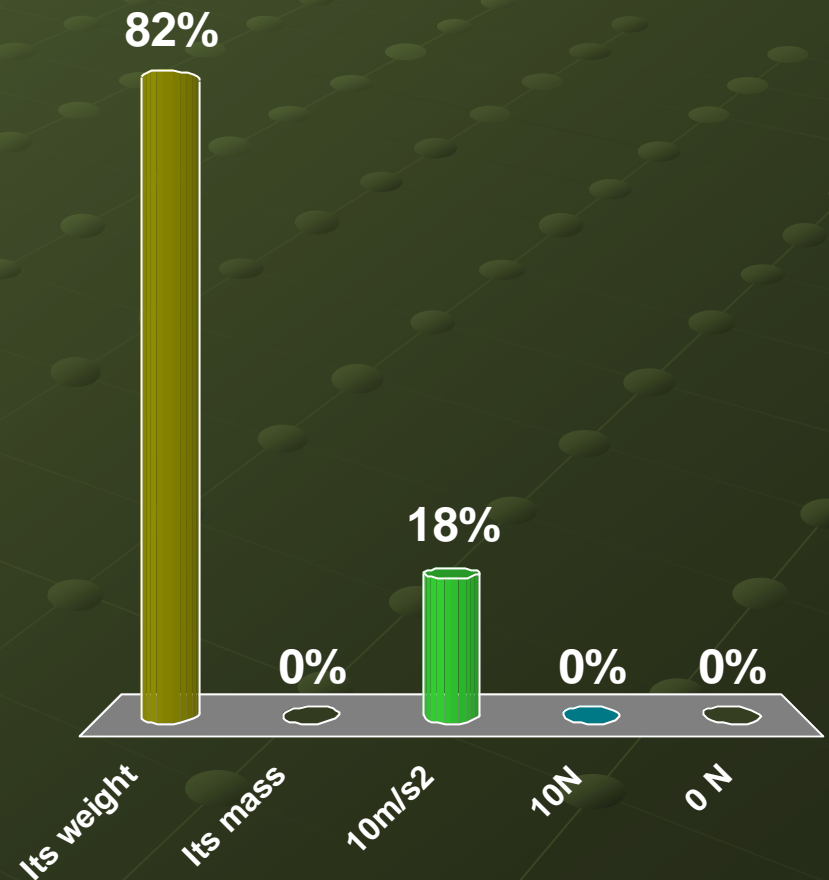
Acceleration and mass are ...

1. Directly proportional
2. Inversely proportional
3. The same thing
4. Divided by one another to obtain an objects net force.



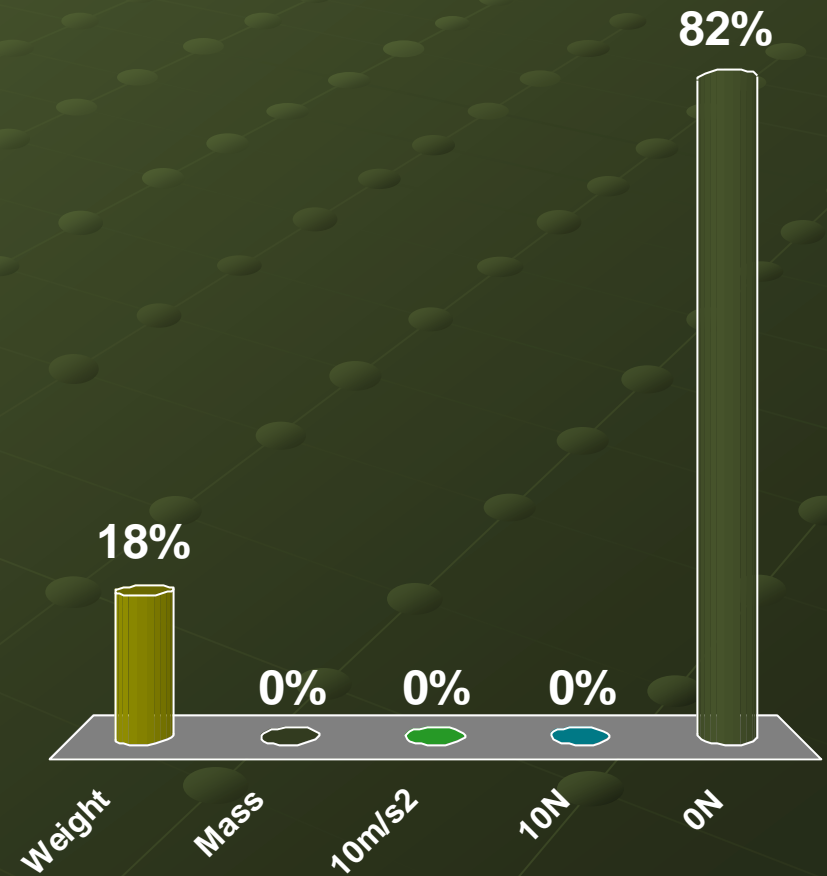
An object in free fall has a net force acting on it equal to...

1. Its weight
2. Its mass
3. 10m/s^2
4. 10N
5. 0 N



An object at rest on the ground has a net force equal to

1. Weight
2. Mass
3. 10m/s^2
4. 10N
5. 0N



Lesson #28

Topic: Graphing acceleration vs. net force or mass

Objectives: (After this class I will be able to)

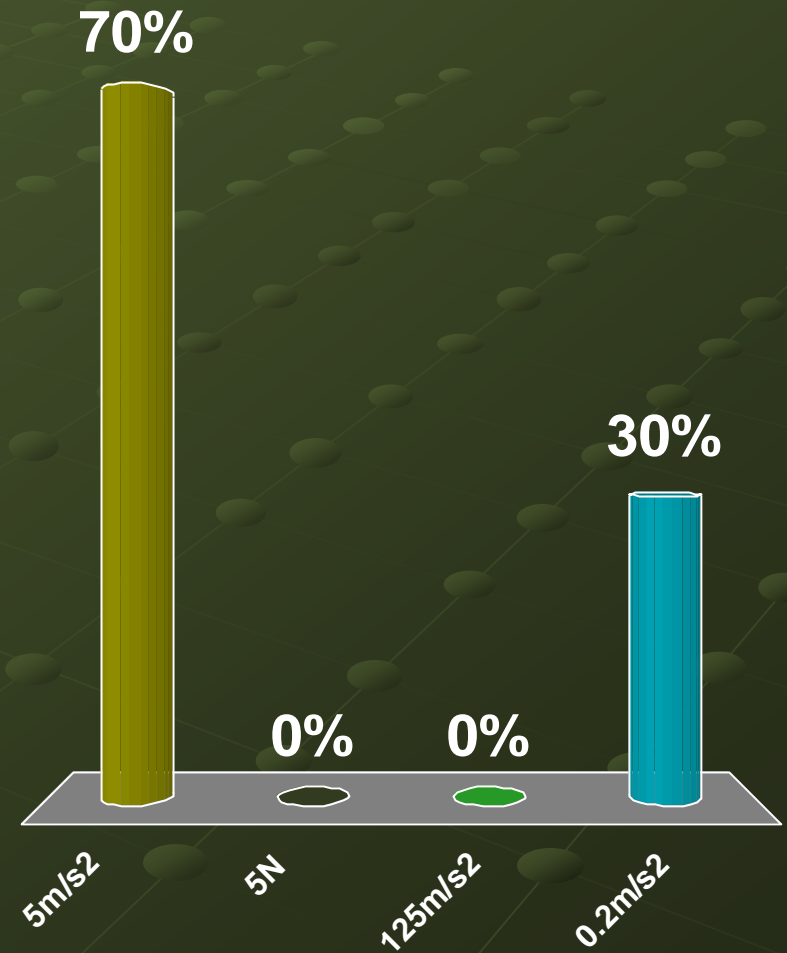
1. Graph the relationships between acceleration, mass, and net force.
2. Write a F_{net} equation specific to each individual problem to solve for an object's acceleration.

Warm Up: What is acceleration of a 5kg bowling ball when a net force of 25N is applied to it?

Assignment: Section 4-1 Quiz & Concept Development 5-1

What is acceleration of a 5kg bowling ball when a net force of 25N is applied to it?

1. 5m/s^2
2. 5N
3. 125m/s^2
4. 0.2m/s^2

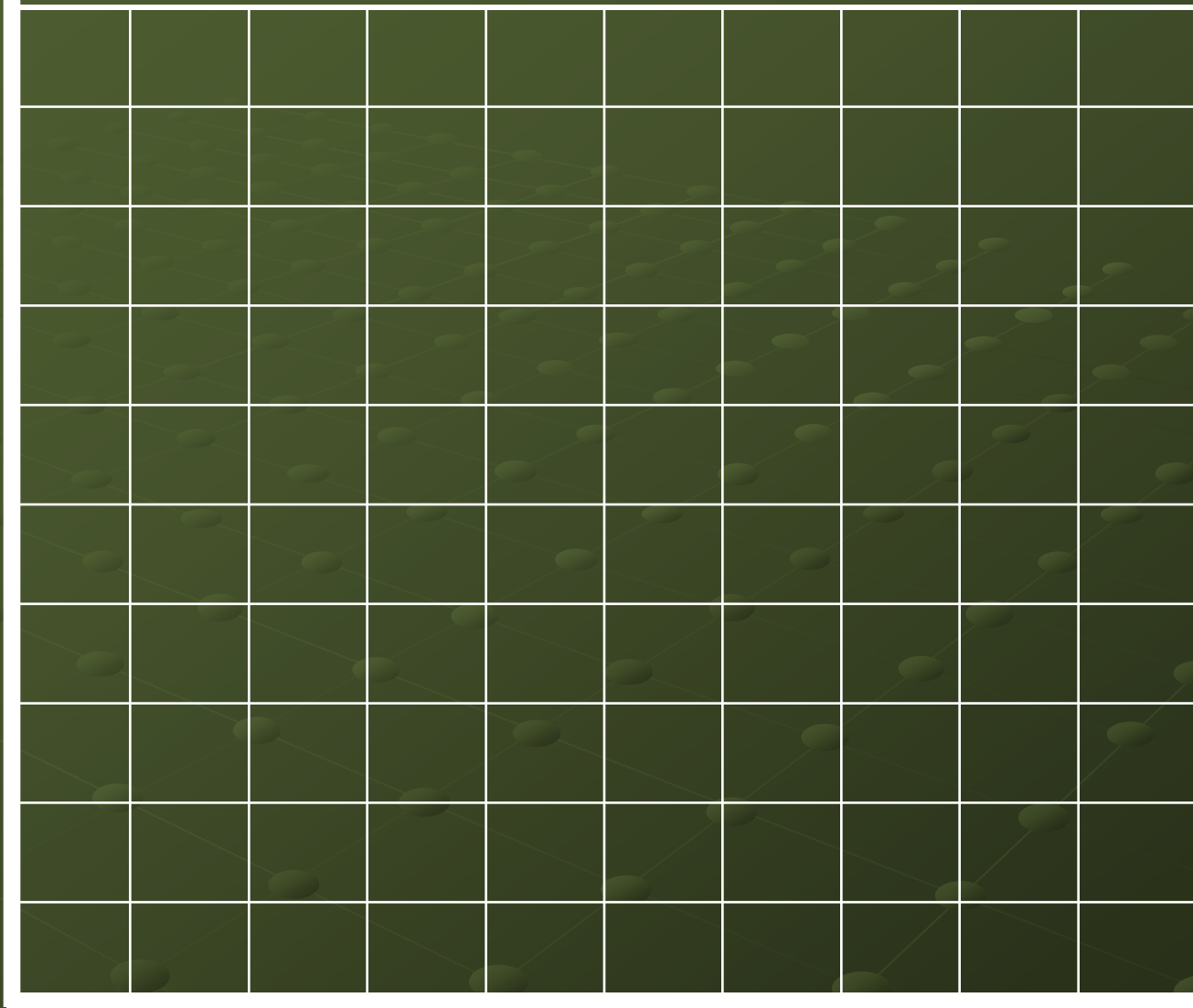


Graphing proportionality

- Acceleration and Net Force are said to be directly proportional, so when one goes up, the other goes up.
- Create an acceleration (y axis) vs. Net Force (x axis) graph representing this relationship.

Acceleration vs. Net Force

A
C
C
E
L
E
R
A
T
I
O
N



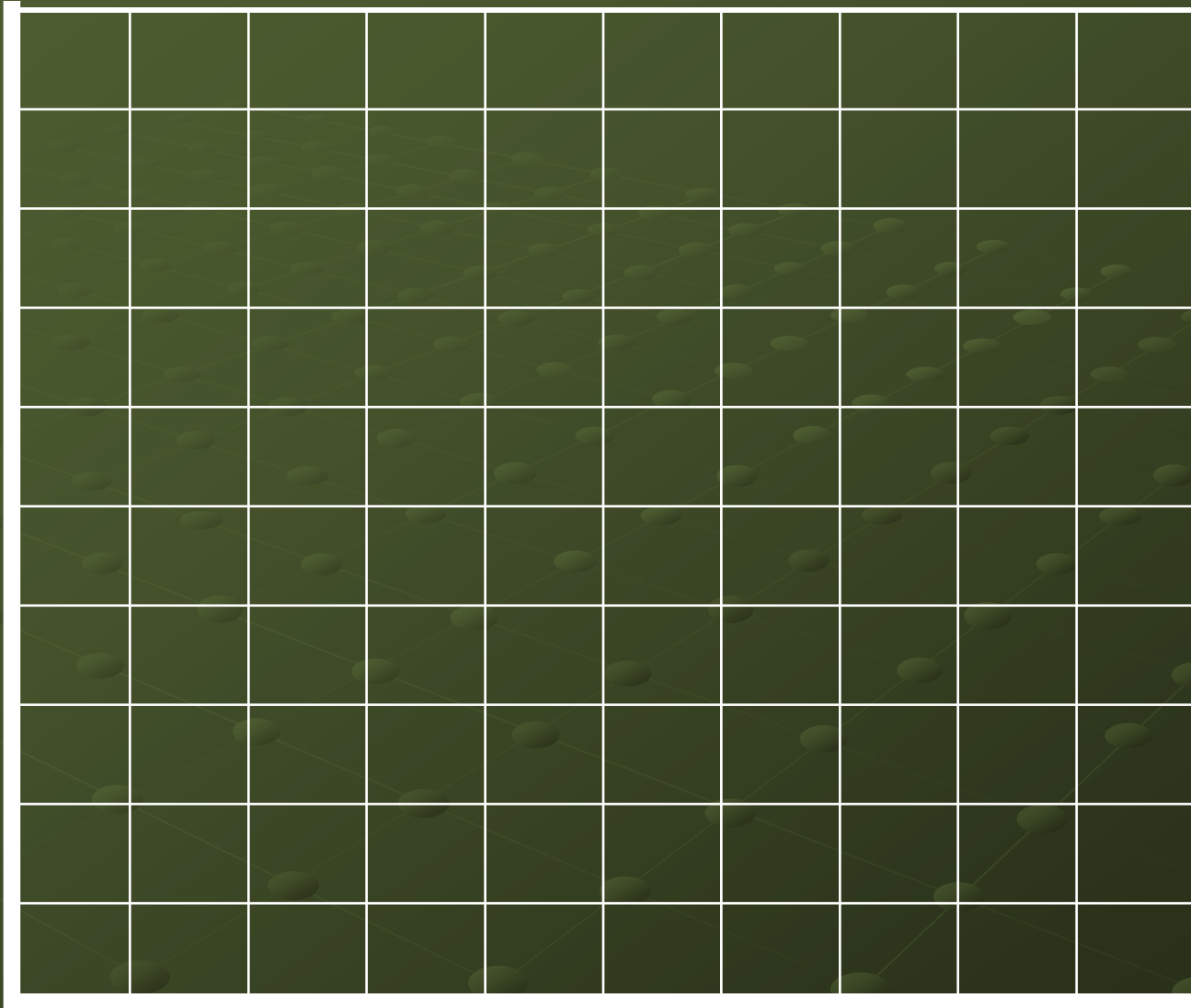
NET FORCE

Graphing proportionality

- Acceleration and mass are said to be inversely proportional, so when one goes up, the other goes down.
- Create an acceleration (y axis) vs. mass (x axis) graph representing this relationship.

Acceleration vs. Mass

A
C
C
E
L
E
R
A
T
I
O
N



MASS

Net Force Problem Solving

- For each problem a different net force equation is needed.
- Will create our own equations based upon the given information.
- All equations written are different for each problem.
- An equation written for one problem may or may not work for a different problem.

Net Force Problem Solving

- You are sliding a 20kg crate of physics books across a tile floor. You apply a force of 50N and the force of friction acting on the crate is 30N. How much is the crate accelerating?
- The first step (after writing your givens) is to draw a picture of the situation with all the forces acting on the object.

Givens



Net Force Problem Solving

- The next step is to remove the forces that do not affect the problem.



- Next, we write an equation to solve for the net force acting on the object.

- For this case...

$$F_{net} = F_a - F_f$$

- Then use substitution to replace unknown variables.

$$F_{net} = ma$$

$$ma = F_a - F_f$$

So...

$$a = \frac{F_a - F_f}{m}$$

- Answer: The acceleration of the crate is 1m/s^2

Net Force Practice Problems

1. You are taking your new pony out in the snow to teach her how to pull a sled. You do not want to over work her so you need to know how much friction the snow will apply to the sled. You put your 50kg little sister on the sled first and find that the pony can accelerate the sled at a rate of 2m/s^2 when she pulls with a force of 300N.

Net Force Practice Problems

2. You go sky diving for the first time ever! You accelerate towards the ground as you are in free fall, but then after your parachute opens you feel like you're floating as you fall at a constant speed towards the ground. Your tension gauge tells you that the air resistance on the parachute is pulling up on you with a force of 850N . What is your approximate mass?

Bonus

3. A rocket is launched with a constant thrust of 25000N and has an upward acceleration of 2m/s^2 . What is the mass of the rocket?